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ABSTRACT

This report presents the rationale, structure, content and procedures for the computerized bank of reading objectives being developed for New York State schools. The project was initiated to provide a technical resource which would contribute to planning, design, and evaluation of reading programs. The report defines the organizing concepts for the project, including a generalized format for writing objectives (the generic objective), a procedure for organizing the generic form of objectives into a summative or criterion objective, and a structure for scaling reading content and associating it with objectives. The report describes a computerized processing technique called SCAN (System for Coding and Analysis), which eliminates redundancy in a developing bank of objectives. The implications of the banking development are discussed in terms of supporting basic and applied research in reading. (Author/CK)

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The Development of the New York State Bank of Reading Proficiency

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Abstract

This report presents the rationale, structure, content, and procedures for the computerized bank of reading objectives being developed for New York State schools. The project was initiated to provide a technical resource which would contribute to planning, design, and evaluation of reading programs.

The report defines the organizing concepts for the project, including a generalized format for writing objectives (the generic objective), a procedure for organizing the generic form of objectives into a summative or criterion objective, and a structure for scaling reading content and associating it with objectives. The report describes a computerized processing technique called SCAN (System for Coding and Analysis) which eliminates redundancy in a developing bank of objectives.

The computer program developed for the project further supports generalized edit and change functions among the banked objectives, in addition to the SCAN operation, and provides for the accession of objectives and content for structuring local banks of reading objectives. The implications of the banking development are discussed in terms of supporting basic and applied research in reading. One focus of the discussion is the support generated by the bank contents and structure for the generation of reading test items via the use of algorithms.

Introduction

The SPPED (System for Pupil and Program Evaluation and Development) Project is a research and developmental effort sponsored by the New York State Education Department (NYSED). The overall project involves the development of a comprehensive information management system which will systematize and bring technological support to bear on several major program development functions in education: planning, design, installation, evaluation, and the transmission and use of evaluative information. The planning and evaluation functions have included substantial development work on the "banking" of a new system of reading objectives, the subject of this report.

The SPPED bank of reading objectives is literally a bank -- an information resource which can be used by educators to structure and define the intended outcomes of local reading programs and the measurement devices for those outcomes eventually selected by users. The present report describes the purposes and characteristics of the bank, the development procedures used, the validation procedures thus far planned, and the implications for research.

Rationale

The initial need for the bank grew out of the practical implications of installing Comprehensive Achievement Monitoring (CAM) in schools.[1] It was soon noted that the independent development of behavioral objectives for each project was nothing short of arduous. For a number of reasons, early collections

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[1]The CAM project, developed by Dwight Allen and William Gorth of the University of Massachusetts, involves use of a computerized test scoring and processing system based on instructional objectives and criterion referenced testing. The NYSED became involved in the further development and installation of CAM in the schools in 1969-70.

or "banks" of objectives available to the schools were only minimally useful in program planning and in meeting related needs for test development criteria in local applications of criterion referenced testing. In no content area were the objectives collections comprehensive, or consistently behavioral. There was a mixture of objectives of apparently differing levels and extent of specificity, indicating a lack of conceptualization of the types of objectives needed to construct a local curriculum. For example, some objectives in a given bank might appear highly specific due to the inclusion of stimulus and response content, while others would be devoid of specific content and thus seemingly communicate greater generality. There were frequent apparent matches of supposedly different objectives in the same bank, the primary difference often being in the level of content included. Selection procedures for objectives usually relied on a gross skills or content classification system and aided only the initial task of accession. Banking processes did not directly aid the more important processes of organizing objectives and related content into types (importance) and levels (difficulty). The foregoing gaps in "banking processes" were reflected in the validity of resulting local curricula and, in turn, in test item and test form development.

The specifications for the NYSED reading bank were developed in recognition of the foregoing problems with instructional objectives collections. A formal planning procedure was used to determine the various user audiences for the bank, and user functions and questions were identified and incorporated into specifications. The primary user audiences were designated as local teachers and specialists in reading, administrative staff and other instructional support personnel, developers of instructional systems and

tents in the reading area, WCSD personnel involved in reading, and researchers. The general characteristics projected for the bank were:

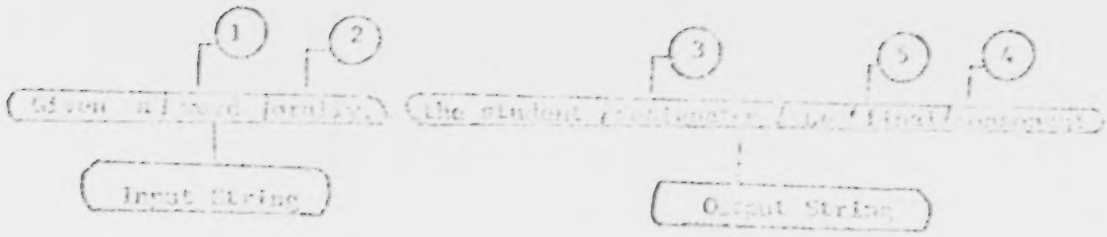
1. It should be all-inclusive of behaviors thought to define or underlie reading.
2. Any component objective should be behaviorally specific (define an operation reliably).
3. It should be parsimonious and should incorporate corrective, refining, and limiting mechanisms.
4. It should contribute directly to the processes involved in organizing objectives into local curricula and organizing and deriving instruction locally.
5. It should contribute to improving efficiency and economy in the processes of specifying and deriving procedures for measuring objectives.
6. It should incorporate technology to aid users in the processes of selecting and organizing objectives for curriculum development and measurement procedures for test development.

Method

The projected characteristics of the bank led to the conceptualization of a standard form for writing reading objectives (or probably any objective). A suggested structure for organizing objectives into preliminary levels was also developed to initially orient users to the idea of structuring objectives and related content into ordered levels of difficulty. The standard form for writing objectives, known as the generic objective (GO), is shown in Figure 1.

Figure 1

Identified Components of the
Generic Objective



The expressed generic form is in standard English syntax divided into an input string (stimulus or stimuli and its modifiers) and an output string (response(s) and its modifiers). The input string identifies the general type of stimulus or stimuli (1) and the general mode of input (2). There are four such modes of stimulus presentation and some combinations thereof: oral, visual, kinesthetic, and from memory (in the last case, the stimulus is provided by the student). By convention the visual mode is assumed identified in the expressed form of objective; the other modes are stated as exceptions. The stimulus (e.g., a word) is always identified generally or generically, may be multiple in type or mode, and may include such modifiers as number, color, and so on.

The output string includes a general operation or behavioral indicator (3), the mode of output, the thing operated on or component (4), and any modifiers (5). As with the input string, the output component is generic and specifies a class of things (e.g., no actual consonant is identified). The indicator is operationalized by reference to more detailed definitions. Designate for example is defined as:

> ... to circle, underline, cross out, check, etc., one or more of a definite number of choices, leaving a physical record of the choice. A "designate" indicator automatically implies a condition in which a number of choices is given.

The current procedure for operationally defining the response indicator might be further extended by replacing the definition with item types or exact descriptions of formalized observational procedures. Only the actual stimulus content then need be added to generate actual test items or observations.

At this point, it is appropriate to briefly consider the advantages of the CO format. The limitations imposed on specificity result in sets of objectives which are at the same level of qualification, have the same general intent, and are to be expressed in the same operations. The objectives are conveniently rendered into specific instructional outcomes by the simple addition of content lists specifying the actual stimuli and responses. There is no need to duplicate any single objective many times over because of minor differences in content in operations, and thus the total number of objectives to be written in a given content area is sharply limited.

To further create a structure within which CO's written in the foregoing format could be used to specify a local curriculum and associated measurement procedures, a conceptual basis was generated for organizing and leveling CO's and generating and leveling associated content. It was expected that the process of generating CO's for reading would also generate a limited number of different content lists, which would categorize reading content. It was reasoned that these lists of content would largely determine the difficulty of an objective and would thus serve to order CO's from simple to complex. Initially, a structure of six arbitrary levels of difficulty were created as shown in Table 1.

The CO's, when completed, were to be placed in one or more of the six levels. Ultimately, it was expected that the procedures would be developed

for scaling the content lists and then associate a level of content with the appropriate CO in the same level. For example, a list of vocabulary words might be ordered into difficulty levels, based on empirically derived word frequencies, and then appropriately related to the same CO in each of the six levels. These levels might also be extended by further division within the initial set of six levels.

Table 1

SPEED Difficulty Levels for Generic Objectives and Associated Content Lists

SPEED Levels	Approximate Grade Level
I	K-2
II	3-4
III	5-6
IV	7-8
V	9-10
VI	10-12

It is obvious from the foregoing scheme that a very large number of specific response outcomes (each CO in a level with a specific item of content) would be included in the levels in Table 1. The number of apparent instructional objectives must run into many thousands, but in contrast, the implicit focus on outcomes in reading instruction is on less specific and highly generalized skills. A provision was made for grouping objectives and associated content into larger units which could be given traditional skill labels. This organizing concept was called a criterion objective or CO and provided the basis for defining the summative outcomes for a given course or level in a reading program. Two types of such CO's

were formulated to define a flexible series of transitional points in a curriculum of reading objectives:

I. The subsuming CO which subsumes the behavioral statements of a grouping of CO's in a level as follows:

Type A: The constituent CO's require a common response; the list of givens includes all those cited in the constituent CO's.

Type B: The set of givens is the same as that for all CO's the response component includes all behaviors specified in all the constituent CO's.

II. The sampling CO--which groups related CO's under a subsuming concept or skill, defines adequate performance in terms of all or a proportion of the CO members in a set.[2]

The projected application of the CO concept was expected to reduce the number of objectives that would actually be defined as terminal outcomes for the levels of a reading curriculum. Within each of the six SOCR levels, the CO's were then to be grouped into CO's, thus also grouping the content lists associated with each CO. The resultant CO clusters, would differ from level to level in terms of content, and would be in the generally accepted criterion or terminal format as follows:

> Given ____ samples of inputs from (Categorical or subsuming descriptor), the student shows mastery at level ___ by generating at least ___% correct outputs in ___ seconds.

Furthermore, the projected leveling and grouping procedure would appear to meet the curricular and instructional needs of users with either conventional or advanced instructional models. The CO-CO groupings could be readily reorganized into smaller or larger groupings, additional levels

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[2]This was by far the most frequently applicable model.

could be defined, and the content lists could be reprogged to match added levels.

Analytical Procedures

The data sources for the initial development of the CO's were existing banks of reading objectives,[3] collections of reading tests and reading materials, and the Random House learning system composed of reading objectives and coordinate test items and instructional resources. The initial step in the analytical process was to convert or derive objectives in the CO format from these data sources. The resultant CO's were coded into the SOBER-2 reading skills classification system (defined at a later point in this report). These classified CO's were then further coded using a unique, computer based grammar designed to aid in the elimination of redundancy as the bank developed. This procedure, called SCAN (System for Coding and Analysis), was applied to convert the content and syntax of each CO into a unique string of numbers. Table 2 shows the SCAN procedure applied to an expressed CO. The first set of cells presents the codes for the input conditions, the second is the code for the output conditions. The coding procedure applied to a single objective allows for four input conditions, four output conditions and four learner operations. Each word in a CO is given a unique code which is in turn recorded in a thesaurus. The first code in the input string (02) is the mode of input, followed by the number of inputs (01C),

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[3] Of considerable assistance at this stage of development were the 800 SOBER-2 objectives provided by Dr. Rodney Skager of the Center for the Study of Evaluation at UCLA.

Table 2

Example of an Expressed GO Translated Into SCAN Numbers and Literal Translation[a]

Expressed GO	Given an incomplete word, the student designates the missing final consonant digraph.

SCAN System Cell Codes

Input Code	02	010	003	000	103	122	000
Lit. Trans.	Visual	One	Word		Com-plete	Not	

Output Code	01	03	010	000	002	002	037	000
Lit. Trans.	Designate[b]	Kinesthetic	One		Con-sonant Digraph	Final	Missing	

[a] SCAN was developed in part by S. Alan Cohen and staff at Random House.

[b] The term "designate" in the coding system has a technical meaning: e.g., to slash, cross out, underline, circle, press, or insert the appropriate visual symbol from a number of alternatives. Therefore, a GO with a designate "operation" automatically denotes output condition: "and given a list of X's from which to select one or more correct responses."

the type of input (002), a subclassification of the input (000), and three cells for modifiers of either the type of input or the subclassification (103, 122, 000). The output component duplicates the input format, with the exception that it begins with the indicator (e.g., designate). The standard syntax of the expressed CO is modified in the literal translation; modifiers are in reverse order of that in the expressed CO.

The SCAN procedure requires a worksheet corresponding to the cells in Table 2 and the thesaurus which is the decoder for each number. Initially, the SCAN codes were keypunched and attempts were made to eliminate redundant CO's from accounting machine printouts of the codes. Later, as the number of CO's became very large (approximately 1800), a computer porgram was developed to identify matching strings of numbers for CO's in the initial bank. The initial computer program further identified potential redundencies in terms of permutations of the order of sets of input and output strings for a CO.

The SOBER-R classification codes applied to the CO's were based on as many as three subclassifications within six broad reading skills categories. Those categories are:

001 Multisensory Readiness Skills

002 Decoding Skills

003 Vocabulary Skills

004 Comprehension Skills

005 Location and Study Skills

006 Reading in Content Areas Skills

The numbering system used for each CO is based on this classification scheme. For example, a CO whose number begins 004 describes a Comprehension

Skills behavior. Comprehension Skills are subclassified into three categories:

004 001 Literal Comprehension

004 002 Interpretation

004 003 Attitude Toward Reading

Each of these Comprehension categories is further subdivided into a number of more specific skill classes. Thus, a GO numbered 004 002 008 would be a Comprehension Skills behavior (first three digits -- 004), involving Interpretation (second three digits -- 002), and, more specifically, calling upon the student to Evaluate Ideas and Information (third three digits -- 008).

Four of the six broad categories have three category levels: the major category, subclass 1, and subclass 2. E.g.: 004 002 008

Major category	004
Subclass 1	002
Subclass 2	008

Category 003, Vocabulary Skills, has only one subclass level. Category 001, Multisensory Readiness Skills, has three subclass levels.

A GO, then, will have two to four sets of three-digit identification numbers indicating the major category and subclasses to which it belongs. In addition, it will have another three-digit number that will identify it as a unique generic objective in a given subclass. Thus, in the ID number 001 002 004 008 002, the first four sets of three digits classify the GO, and the last three digits indicate it is the second GO in that classification.

The classification scheme is shown in its entirety in Appendix A. The numerical coding procedures for the classification system were incorporated into the preliminary computer program.

At this point in the development of the bank of reading objectives, some 1800 CO's had received SCAN numbers and the classification codes. All of this coding was keypunched; a run of the preliminary computer program identified some 50 potentially redundant objectives. Most of these proved to be coding errors in SCAN or in the classification system. To further test SCAN, some objectives were deliberately coded in matching, non-matching, and partially redundant strings. The computer program provided appropriate output in all instances. The procedures thus far developed may be summarized as follows:

1. Any new source objective could be identified as actually a new behavioral statement or as redundant or potentially redundant with the existing data bank.
2. The CO format and SCAN tended to reduce ambiguities in the language used for stating behavioral objectives.
3. The relationship between CO's and potentially matching test items could now be determined by applying the SCAN code to the latter component.
4. A potentially efficient procedure had been developed for limiting the size of any bank of instructional objectives. The objective of parsimony had thus been achieved.

Following the completion of SCAN and the application of the classification codes to the CO bank, the remaining development effort focused largely on developing the CO-CO groupings and the content lists, as well

as the herculean task of editing. The CO-CO groupings were developed by identifying logical groupings of the CO's in a level which would fit into one of the 72 formats, such as the sampling objectives discussed previously. The actual CO was created by cross-correlating four types of data: the SOAL-R classification codes for each constituent CO, the CO type, the SPPED level, and a new descriptor created for the CO-CO grouping. An example follows:

CO Descriptor: Substitution of medial consonants

Related CO Numbers: 002/002/002/006/000 002/002/002/005/000
002/002/002/004/000 002/002/002/003/000
002/002/002/002/000 002/002/002/001/000

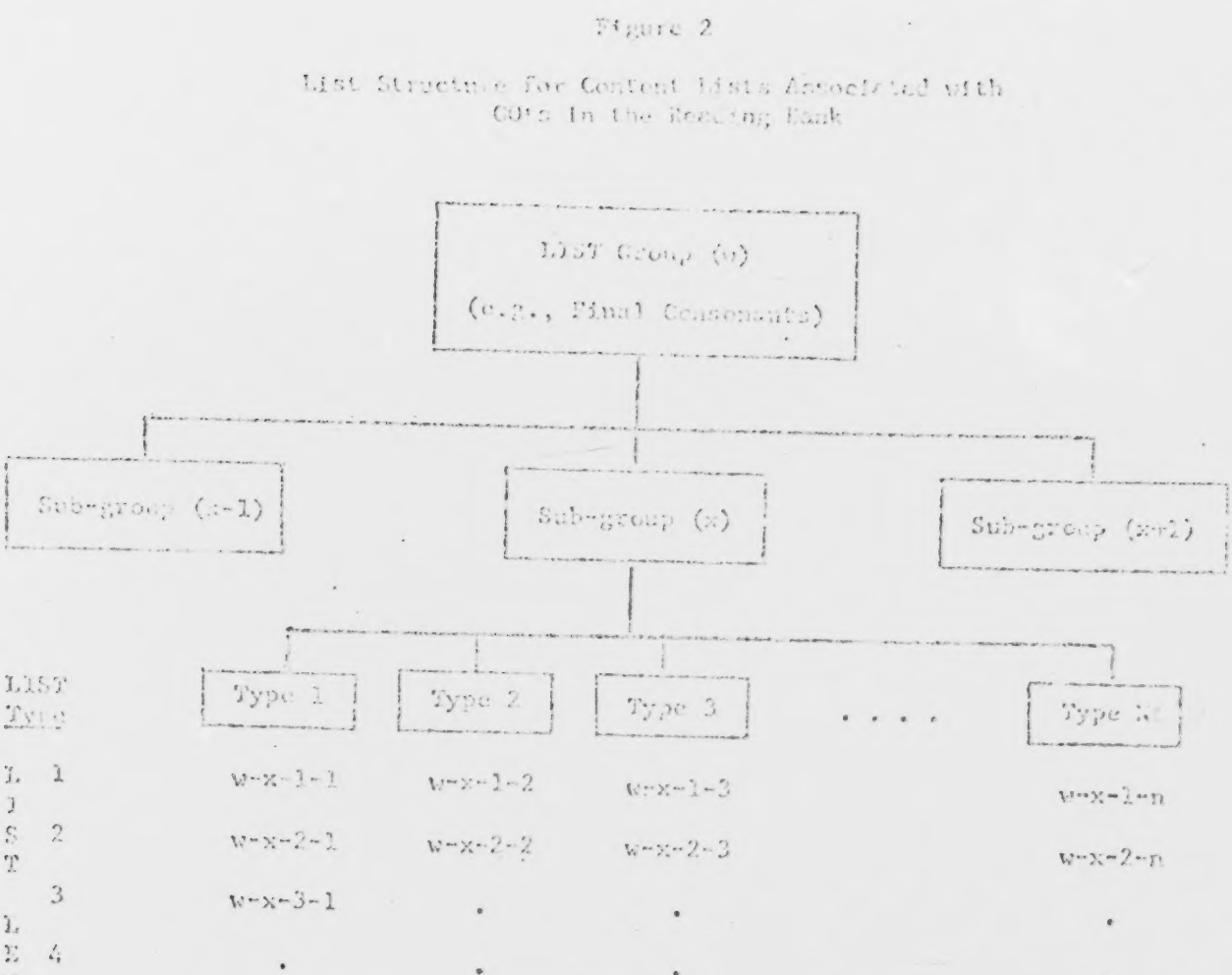
CO: Given orally ___ sets consisting of a two syllable word and a letter, the student substitutes the single letter for the medial consonant of the given word and says the word thus formed in a total time of ___ seconds for all ___ sets at ___% accuracy.

The content lists were created by generating first a "list of lists" composed of mutually exclusive categories or types of inputs and outputs across all CO's in the bank. This initial list of lists was one of several inputs which resulted in the list structure depicted in Figure 2.

As shown in Figure 2, the initial classification code is the list group, which is the category drawn from the list of lists (e.g., final consonants). Each list group may in turn be classified into subgroups. Each list is further classified by SPPED level, I-VI, and by type, words, pictures, etc. Each list of content so categorized is associated with a particular CO number, and through the CO with a CO number.

Figure 2

List Structure for Content Lists Associated with CORs in the Reading Bank



The data sources for the lists were existing word lists and other content elements drawn from a variety of testing and reading materials. The level number of the content is being identified by reference to the graded level of the material (e.g., content drawn from a pre-primer would be located in level I). The progress of this task has proceeded to the point where the number of content lists and their size may be estimated as shown in Table 3.

Table 1

Estimated Number and Size of
Content Lists for the ExO

LIST Type	Estimated Number	Examples per LIST	Estimated Maximum 'Words' per Example	Estimated Maximum 'Words' per LIST	Estimated Maximum 'Words' per LIST Type
Words	400	10--200	2	400	160,000
Pictures	70	10--200	3	600	42,000
Substitutions	40	10--200	2	400	16,000
Sentences	300	10--200	15	3000	900,000
Selections	80	10--100	150	15000	1,200,000
Sounds	10	10--200	3	600	6,000

Estimated total LISTs: 1000
Estimated total words: 2,500,000

User Procedures

To this point user procedures developed to aid the process of banking have been largely manual, with the exception of a brief program written to identify redundant objectives via SCAN codes. The process of manual editing has included detailed checking of every component of the bank and their interrelationships. Every GO, for example, has been checked in terms of its consistency with the GO format. The GO-CO groupings have been continuously reviewed and the reliability of SCAN has been checked using two independent sets of raters.

A preliminary manual process has been made available for the selection of GO's, based on a slight modification of the procedure given in the manual for the initial set of SOBE-R objectives. In this procedure, the appropriate audience utilizes the classification system as shown in Appendix A to select proto-objectives, the final level in the classification system. From there, the user ultimately selects the SPECIFIC CO's in the

proto-objective category which are to be included in the grade levels in the reading program. This process is depicted in part in Table 4. The user is then able to access the GO's most closely related to the levels in the local curriculum and the content lists for each GO. Manuals containing the actual GO's, GO-GO groupings, and content lists are being prepared to support the selection process.

The need for some rapid method of mass data storage, manipulation, and retrieval to generally support anticipated functions of the various user audiences for the bank has been met through the recent development of a computer program. With the soon-to-be-completed loading of the objectives and associated data in the computerized banking program, such functions as editing and selecting a local curriculum of reading objectives will be more easily managed. In addition, this banking program will support the inclusion of test items and instructional resources correlated with the GO's. These programs allow the bank to be stored on a mass storage medium such as magnetic tape, or in some cases magnetic discs. These programs have the capability of accessing all of the bank or selected subsets of the bank as well as complete editing and updating capabilities. It is anticipated that several large computer centers located throughout the State will maintain a copy of the computerized bank. Additionally, a central, State maintained CBOIR (Computerized Bank of Objectives, Items, and Resources) will be used to provide quality control over the entire banking operation.

The CBOIR system consists of three major subsystems. The inquiry subsystem is used by the local level user to select subsets of the objectives according to sets of criteria specified by the user. Users may select subsets of the objectives by specifying ranges of objective numbers, SPPED levels, entry dates, or any other criteria stored in the CBOIR. Combinations

Table 4

An Excerpt from the SFPED Procedure for Manual Selection of GO's

PROTO - OBJECTIVE Code numbers are those found in the SFPED Classification System. However, zero place holders have been omitted. Thus, 001-001-001-001 = 1-1-1-1		E = Essential at This Grade Level S = Supplementary for This Grade Level			N = Not Appropriate at This Grade Level I = Irrelevant to Reading		
		1st	2nd	3rd	4th	5th	6th
1-1-1-1	Differentiate likenesses and differences in sounds.	E S N I	E S N I	E S N I	E S N I	E S N I	E S N I
1-1-1-2	Identify common environmental sounds.	E S N I	E S N I	E S N I	E S N I	E S N I	E S N I
1-1-1-3	Differentiate directions and sources of sounds.	E S N I	E S N I	E S N I	E S N I	E S N I	E S N I
1-1-1-4	Distinguish among sound characteristics.	E S N I	E S N I	E S N I	E S N I	E S N I	E S N I
1-1-1-5	Specify the number of syllables in words.	E S N I	E S N I	E S N I	E S N I	E S N I	E S N I
1-1-2-1	Listen for a series.	E S N I	E S N I	E S N I	E S N I	E S N I	E S N I
1-1-2-2	Recall and follow directions.	E S N I	E S N I	E S N I	E S N I	E S N I	E S N I
1-1-2-3	Listen for specific details.	E S N I	E S N I	E S N I	E S N I	E S N I	E S N I
1-1-3-1	Imitate sounds.	E S N I	E S N I	E S N I	E S N I	E S N I	E S N I
1-1-3-2	Repeat oral selections.	E S N I	E S N I	E S N I	E S N I	E S N I	E S N I
1-1-3-3	Repeat variations in pitch, stress, and juncture.	E S N I	E S N I	E S N I	E S N I	E S N I	E S N I
1-1-4-1	Listen for main ideas.	E S N I	E S N I	E S N I	E S N I	E S N I	E S N I

of criteria may be used with "and" or "or" concepts within certain limitations. The user may also determine to what extent the objective and associated information, such as lists, test items, and resources, will be included in the final report. The report format and order will be specifiable by the user also.

The update subsystem is primarily intended to be used by the personnel in charge of the central CCOIR. This subsystem contains programs which will allow all types of information to be replaced, added, inserted, or deleted. Appropriate forms have been developed to facilitate these activities.

The new SCAN code subsystem is designed to be used by the personnel in charge of maintaining quality control over the contents of the CCOIR. The SCAN subsystem provides means for eliminating redundancies between objectives as well as techniques for extracting portions of the CCOIR that may potentially be redundant, based on permutations of input and output strings and on modifiers within strings. Qualified reading specialists may then review these objectives to determine if any further action is necessary. An overview of the CCOIR system is presented in Figure 3.

The file structure of the CCOIR is shown in Figure 4; with the exception of the Tape Objective files, all files are stored on disc storage. The disc files are for the most part index sequential, but a few are sequential, and all records are of a card image type. The programs are written in ANSI-COBOL with no special IBM features. The basic system requirements will be 50k bytes (IBM or equivalent) of CPU storage, four (4) tape drives, two (2) disc packs, a high speed printer, and card reader. The system will initially be installed on an IBM 360/40 and a CDC 3300. This will make available Job Control Language for these systems. Extensive documentation, in the form of three (3) manuals will be available. These are, a Systems Manual, Users Manual, and Operations

Figure 3

New York State Reading Objectives Reading System:
System Overview

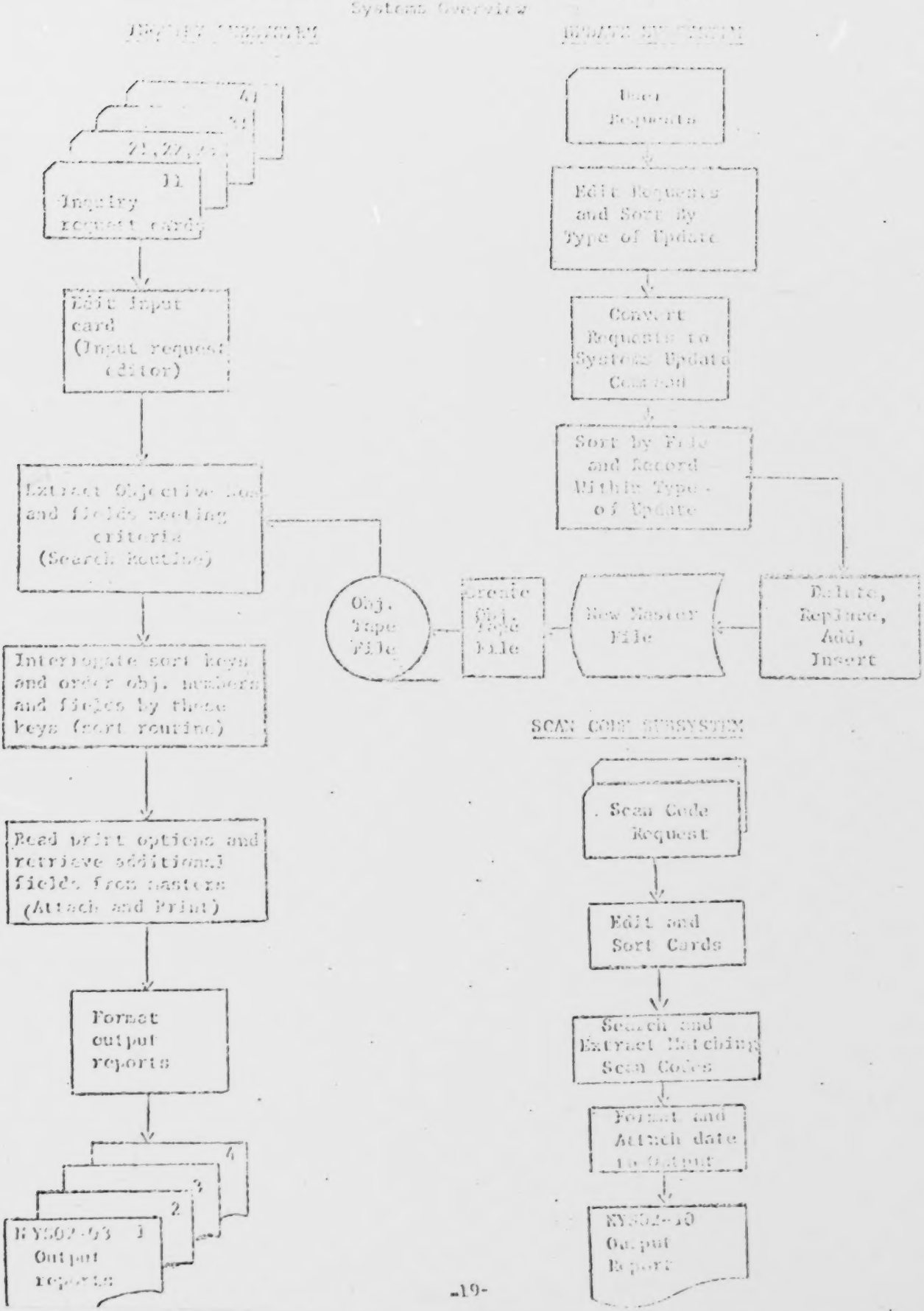
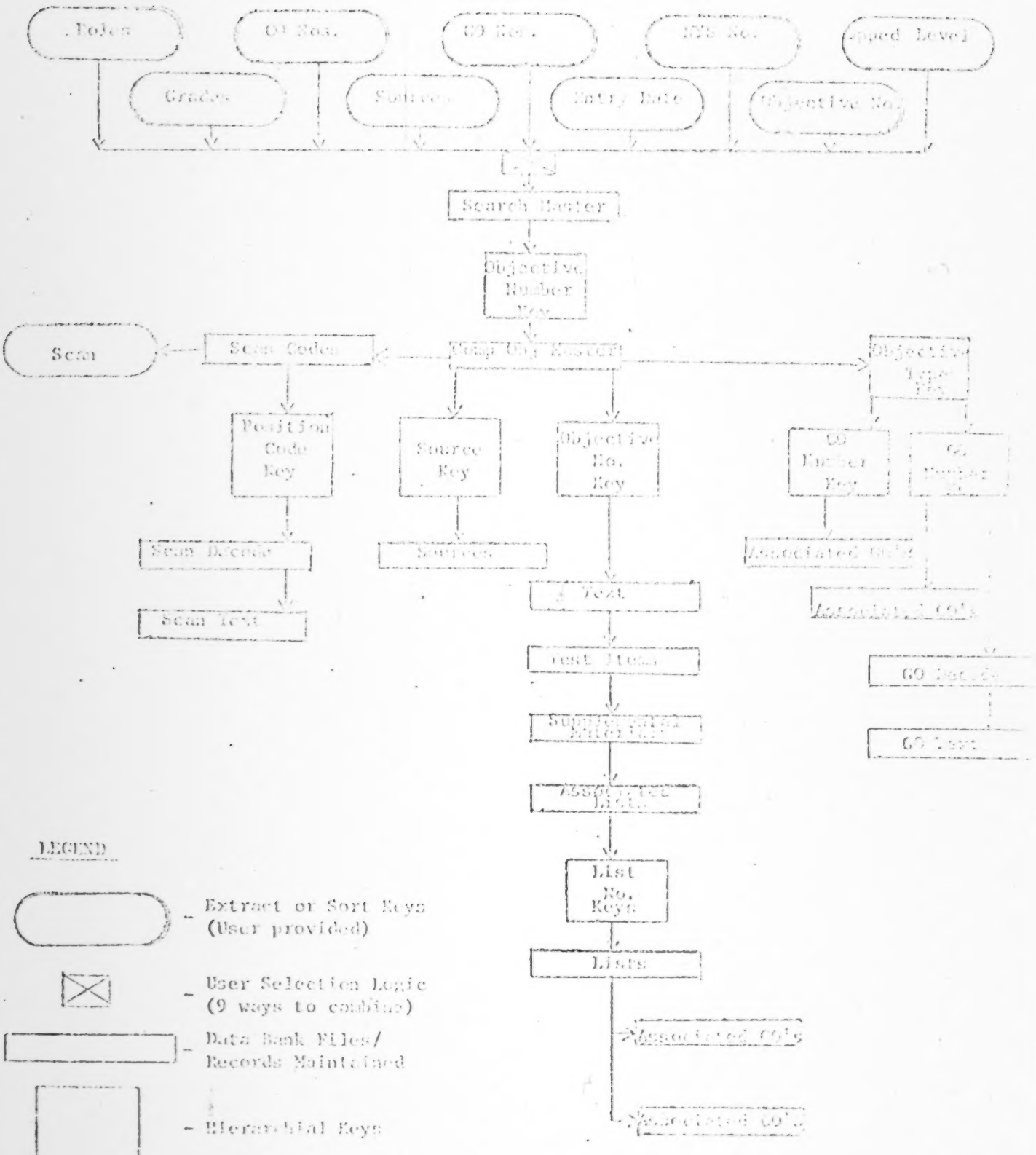

INQUIRY SUBSYSTEM
UPDATE SUBSYSTEM
SCAN CODE SUBSYSTEM
Inquiry request cards
Edit Input card (Input request editor)
Extract Objective Nos and fields meeting criteria (Search Routine)
Interrogate sort keys and order obj. numbers and fields by these keys (sort routine)
Read print options and retrieve additional fields from master (Attach and Print)
Format output reports
RY502-03 Output reports
User Requests
Edit Requests and Sort by Type of Update
Convert Requests to System Update Control
Sort by File and Record Within Type of Update
Delete, Replace, Add, Insert
New Master File
Create Obj. Tape File
Obj. Tape File
Scan Code Request
Edit and Sort Cards
Search and Extract Matching Scan Codes
Format and Attach date to Output
RY502-50 Output Report

Figure 4

New York State Reading Objectives Banking System:
File Specifications (Hierarchial File Structure)



Manual. The manual and programs will conform to NYSED[4] standards in order to support implementation on the BOCES[5] computers.

Planned Validation

Procedures for validating the reading bank are just now getting underway with the projected completion of the content lists in March - April, 1973. The validating effort is planned as part of a continuing release of the objectives and content lists through some 14 regional BOCES centers in New York State. An initial dissemination effort will offer training workshops in the SPEED reading bank to virtually every district in the State through the 1972-73 and 1973-74 school years. Subsequently, certain of the regional centers will be established for training in association with the reading bank and in the operation of distribution and feedback mechanisms for bank users. It is intended to build the validating effort on the distribution-feedback mechanisms thus established.

The validation effort will initially focus on determining the extent to which the CO's are generally recognized as instructional outcomes across school programs in reading. Data from the various user audiences should serve to locate each CO or CO grouping in relation to levels and types of reading programs, and perhaps population characteristics. Ultimately, the data from the various user audiences should serve to make judgements about the adequacy of local curricula and of the extent to which current testing efforts overlap with the intended outcomes of local reading programs. This process of validation will undoubtedly result in significant change to the content and organization of the current bank of reading objectives and related information.

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[4]The NYSED is in the process of developing regional computing centers for the schools, based on hardware and software standards provided by the staff of NYSEIS (New York State Educational Information System).

[5]BOCES (for Boards of Cooperative Educational Services) operate computer centers and conduct other activities as shared services for a group of designated districts in a prescribed area of the State.

Implications for Research And Application

Additional funding is being sought to continue the reading bank development along certain promising lines and to make the results of this effort more broadly available. Among the more exciting lines of research or application may be included the following:

1. Some recent research suggests that conventional methods of scaling the difficulty of sentences, paragraphs, and selections may be considerably advanced by new methods for scaling syntactic and conceptual complexity. Potel and Granowsky (1972) have, for example, worked out a procedure for measuring syntactic complexity, based on transformational grammar.
2. The latest research on word frequencies (Francis, 1971; *American Heritage Encyclopedia*, 1971) may receive relatively direct application in specifying the selection of word lists and the associated levels of application in the existing reading bank structure. This would tend to update existing word lists which are 20-30 years old and are based on more limited samples of reading materials.
3. Some of the newer studies on test item development procedures (e.g., Bormuth, 1970) suggest the feasibility of improving the efficiency of test item generation through the use of algorithms or formalized rules. Given solutions to some of the foregoing scaling problems, the structure of the reading bank should provide an ideal basis for rule-generated test items in reading.
4. A final area of promising research would be developed on the demonstrated validity of the reading bank in reflecting the

outcomes of reading programs and on the ability to generate related measurements. This research would be policy oriented and would examine the differential sensitivity of criterion-referenced (based on the reading bank) and norm-referenced tests in measuring the expected outcomes in relation to programs and related school and student body factors -- as opposed to non-school factors.

In closing, it is worth mentioning the promise that a technically adequate bank of objectives holds for some of the general problems of research in reading. A comprehensive bank of reading criteria, for example, is required to generally determine the contributions of lower level skills to meaningful reading performance. The ability to compare results among studies in reading may be improved by reference to types and levels of performance in the bank. A final example, may be found in the potential contributions of CO's or CO groups in aiding the identification of learning paradigms that are applicable to the reading outcomes or underlying skills included in the bank.

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Appendix A

Organizational Structure and Classification Codes
for the SOBE-K Testing Tool

[illegible]	[illegible]
Auditory Skills	001 001
Acquire Auditory Discrimination	001 001 001
Differentiate likenesses and differences in sounds.	001 001 001 001
Identify common environmental sounds.	001 001 001 002
Differentiate directions and sources of sounds.	001 001 001 003
Distinguish among sound characteristics.	001 001 001 004
Specify the number of syllables in words.	001 001 001 005
Acquire Auditory Memory	001 001 002
Listen for a series.	001 001 002 001
Recall and follow directions.	001 001 002 002
Listen for specific details.	001 001 002 003
Reproduce Auditory Material	001 001 003
Imitate sounds.	001 001 003 001
Repeat oral selections.	001 001 003 002
Repeat variations in pitch, stress, and juncture.	001 001 003 003
Acquire Listening Comprehension	001 001 004
Listen for main ideas.	001 001 004 001
Listen for details.	001 001 004 002
Identify sequence.	001 001 004 003

*Gaps in numbering are due to elimination of subclasses found in original SOBE-K System.

Interpret descriptive language. 002 001 004 004

Identify relationships. 001 001 004 005

Recognize emotions. 001 001 004 006

Oral Language 001 002

Acquire Oral Language Skills in Semantics 001 002 001

Utilize a vocabulary appropriate to the learner himself, his home and family, his school and play activities, his community and environment. 001 002 001 001

Interpret, classify, and relate objects, pictures, and spoken words. 001 002 001 002

Utilize vocabulary appropriate to needs and emotions. 001 002 001 003

Interpret number concepts. 001 002 001 004

Compare diverse situations. 001 002 001 005

Establish and describe sequences of events. 001 002 001 006

Determine cause and effect and predict outcome. 001 002 001 007

Use new words. 001 002 001 008

Relate and interpret experiences. 001 002 001 009

Acquire Aural-Oral Language Skills in Phonology 001 002 002

Identify, compare, and reproduce beginning consonant sounds (single, blends, digraphs). 001 002 002 001

Identify, compare and reproduce final consonant sounds (single, blends, digraphs). 001 002 002 002

Identify, compare, and reproduce medial consonant sounds (single, blends, digraphs). 001 002 002 003

Identify, compare, and reproduce initial final, and medial consonant sounds (single, blends, digraph). 001 002 002 004

Identify, compare, and reproduce vowel sounds (short, long, digraphs, diphthongs). 001 002 002 005

Identify, compare, and reproduce English words.	001 002 002 000
Oral Language	001 002
Acquire basic language skills in syntax	001 002 003
Identify and construct substitutions of parts of speech (nouns, verbs, pronouns, adjectives, adverbs) in simple sentences.	001 002 003 001
Identify and construct multiple substitutions of parts of speech (nouns, verbs, adjectives, and adverbs) in simple sentences.	001 002 003 002
Recognize and use complete sentences (past, present, and future forms).	001 002 003 003
Identify and construct sentences with compound subjects, verbs, adjectives, adverbs, or pronouns.	001 002 003 004
Identify and use subordinators and coordinators.	001 002 003 005
Identify and use prepositions.	001 002 003 006
Identify and use determiners	001 002 003 007
Use auxiliary words	001 002 003 008
Identify and construct transformations	001 002 003 009
Acquire oral language skills in morphology	001 002 004
Identify and form plurals	001 002 004 001
Use correct verb form	001 002 004 002
Use contractions	001 002 004 003
Use compound words.	001 002 004 004
Use positive, comparative, and superlative forms of adjectives.	001 002 004 005
Use of possessive forms of nouns and pronouns.	001 002 004 006
Use verbs to form agents	001 002 004 007
Use inflected endings.	001 002 004 008

Basic Abilities	001 003
Identify body parts, surfaces, and functions	001 003 001
Identify position and direction in space.	001 003 002
Visual Skills	001 004
Develop Visual Perception	001 004 001
Acquire visual discrimination	001 004 001 001
Develop perceptual speed	001 004 001 002
Develop sense of spatial relations	001 004 001 003
Develop Visual Memory	001 004 002
Develop Visualization Skills	001 004 003
Coordinate Eye-Hand Skills	001 005
Develop Eye-hand coordination	001 005 001
DECODING SKILLS	002
Recognize and Use Letters of the Alphabet	002 001
Recognize manuscript letters	002 001 001
Recognize cursive letters	002 001 002
Recognize alphabetical order	002 001 003
Identify vowels and consonants	002 001 004
Use Letters	002 001 005
Recognize Sound Symbol Relationships (Phonics)	002 002
Identify initial single consonants	002 002 001
Identify final single consonants	002 002 002
Identify medial single consonants	002 002 003
Identify initial consonant digraphs	002 002 004
Identify final consonant digraphs	002 002 005
Identify medial consonant digraphs	002 002 006
Identify final consonant blends	002 002 007

[illegible]	[illegible]
Identify consonant sounds (single, digraphs, and blends).	002 002 010
Identify short vowel sounds	002 002 011
Identify long vowel sounds	002 002 012
Identify vowel controllers	002 002 013
Identify vowel digraphs	002 002 014
Identify vowel sounds (short, long, etc.)	002 002 016
Identify silent letters	002 002 017
[Apply Rules of Spelling and Usage]	[002 003]
Apply phonic generalizations	002 003 003
Apply rules of punctuation and capitalization	002 003 004
[Recognize the Division of Words into Units of Meaning (Structural Analysis)]	[002 004]
Identify compound words	002 004 001
Identify inflectional endings	002 004 002
Identify contractions	002 004 003
Identify abbreviations	002 004 004
Identify syllabication and word accents	002 004 005
Identify prefixes, suffixes, and roots	002 004 006
[VOCABULARY SKILLS]	[003]
Incorporate listening and speaking skills into reading vocabulary	003 001
Recognize and use synonyms, homonyms, antonyms, and heteronyms.	003 002
Recognize word meaning from context	003 003
Recognize historical origins	003 004
Recognize and use non-literal language	003 005

Recognize denotation, connotation, and nuance	003 006
[COMPREHENSION SKILLS]	[004]
[Literal Comprehension]	[004 001]
Identify main ideas and major concepts	004 001 001
Find and relate details	004 001 002
Recognize sequence of ideas	004 001 003
[Interpretation]	[004 002]
Understand relationships	004 002 001
Recognize cause and effect	004 002 002
Make inferences	004 002 003
Interpret figurative and descriptive language	004 002 004
Recognize and interpret emotional reactions	004 002 005
Identify and arrive at conclusions and generalizations.	004 002 006
Compare and contrast information and ideas	004 002 007
Evaluate ideas and information	004 002 008
Develop critical reading skills	004 002 009
Develop oral reading skills	004 002 010
[Attitude Toward Reading]	[004 003]
Read for enjoyment	004 003 002
Appreciate reading	004 003 003
Relate personally to reading	004 003 004
[LOCATION AND STUDY SKILLS]	[005]
[Recognize and Use Textbook Aids]	[005 001]
Title page	005 001 001
Copyright	005 001 002
Format	005 001 003

Recognize and Use Textbook Aids (Cont'd.)	005 001
Table of Contents	005 001 004
Section and paragraph headings	005 001 005
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Boldface type	005 001 007
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Identify and Use Library Resources	005 002
Organization and Card catalogue	005 002 001
Location of materials	005 002 002
Identify and Use Other Sources of Information	005 003
Dictionaries	005 003 001
Encyclopedias	005 003 002
Magazines	005 003 003

Identify and Use Other Sources of Information	005 003
Newspapers	005 003 004
Maps and atlases	005 003 005
Graphs, charts, tables, diagrams	005 003 006
Pictures	005 003 007
Specialized reference materials	005 003 009
Use Effective Study Procedures	005 004
Follow directions	005 004 001
Determine appropriate sources of information	005 004 002
Skim for general information	005 004 003
Read for main ideas	005 004 004
Read for details	005 004 005
Locate summary sentences or paragraphs	005 004 006
Increase reading rate	005 004 007
Adapt reading rate, to nature, purpose, and difficulty of material.	005 004 008
Recall information	005 004 010
Appraise adequacy of information and evaluate sources for authenticity and reliability.	005 004 011
Organize Materials	005 005
Sequence information	005 005 001
Classify information according to identifiable rationale, criteria, or system.	005 005 002
Write summaries	005 005 003
Construct outlines	005 005 005
Construct charts, graphs, tables, and diagrams	005 005 006
Construct bibliographies	005 005 007
Construct footnotes	005 005 008

Organize Materials (Cont'd.)	005 003
Construct tables of contents	005 003 002
READING IN CONTENT AREAS	006
Reading in Literature	006 001
Recall title, author's name, and important details	006 001 001
Identify characters and describe characterization	006 001 002
Describe plot and structure	006 001 003
Describe setting	006 001 004
Describe and discuss literary devices and techniques	006 001 005
Describe and discuss symbolism and figurative language	006 001 006
Describe diction, usage, and tone	006 001 007
Identify and describe theme	006 001 008
Identify and describe genre	006 001 009
Evaluate author's purpose, values, theme relevance and effectiveness	006 001 010
Reading in the Social Sciences	006 002
Identify cause-and-effect relationships	006 002 003
Make inferences and generalizations	006 002 004
Analyze problems and propose solutions	006 002 005
Compare and contrast facts and opinions	006 002 006
Reading in Science	006 003
Identify details	006 003 003
Recognize order and sequence	006 003 004
Infer cause-and-effect relationships	006 003 005
Distinguish fact from opinion, hypothesis, and theory	006 003 006
Relate present reading to current problems	006 003 007

Reading in Other Arts	006 004
Identify the problem	006 004 002
Make generalizations	006 004 004